FAA /Initial Proposal
Presented To The
Aircraft Takeoff Noise Abatement
Joint FAA/Industry Working Group
June 19, 1990

ATCH 4-31

Aircraft Takeoff Noise Abatement
Joint FAA/Industry Working Group

INITIAL AIRCRAFT TAKEOFF NOISE ABATEMENT CONFERENCE
June 19, 1990 - 9:00AM - 5:00PM
ALPA's Facilities, Room 804
8th Floor, 1625 Massachusetts Ave., S.W., Washington, DC

PROBLEM: Because of a variety of unique runway/community situations and the varying performance and noise characteristics of different aircraft, there has been an increasing use of non-standard takeoff noise abatement procedures. In some cases communities have established criteria that cause operators to use special procedures to remain competitive in that community's air transportation market. Although a special (nonstandard) procedure may not have a significant effect when considered alone, there is a potential for a negative effect on safety when these special procedures vary from airport to airport and runway to runway. The lack of standardization generally has a negative effect on safety. There is a need to address these potentially negative effects and to establish a program to ensure that adequate safety levels are maintained. A profileration of special noise abatement takeoff and initial climb procedures could degrade safety because of the following:

1). The complexity of the special procedures could divert attention from normal pre-departure tasks (ATC clearances, cockpit setup, checklists, briefing emergency procedures).

2). Possible diversion of attention from normal tasks during takeoff and initial climb (performance monitoring, see and avoid, ATC, weather).

3). Thrust reductions at low altitude, for noise abatement purposes, will reduce obstacle clearance, could require abrupt changes in flight path, complicate emergencies such as engine failure, and reduce aircraft performance in adverse weather such as windshear/icing.

4). Possible increase in human errors due to confusion between nonstandard and standard procedures.

5). Exposure to failure risks earlier and at lower altitudes when such failures can be induced by power changes, mode switching, and configuration changes.

OBJECTIVES: The objectives of the aircraft takeoff Noise Abatement meeting are to bring interested parties together, discuss and review the issues in detail (both national issues and John Wayne issues), present proposals for resolution of identified problems, make tentative decisions on the approach to take in view of the requirement of FAR 91.87(f), and to establish a smaller working group to work out the details of an acceptable alternatives.

Proposed Objectives: The following objectives are proposed for the joint FAA/Industry effort to resolve takeoff noise abatement issues:

- Define a satisfactory noise abatement procedure or a combination of procedures that is or are consistent with safe operations and agree to adopt the procedure or combination of procedures as industry standards.

- Establish a standard noise abatement procedure or a combination of standard procedures that cannot be changed by an individual operator or approved by an individual FAA Flight Standards District Office without a complete FAA/Industry review and agreement concerning the overall affect the change will have on systemwide operational safety and noise relief benefits.

- Make the standard noise abatement procedure(s) the only procedures(s) available for flightcrew training and use at any airport where noise relief can be achieved by adjusting the takeoff and initial climb (vertical) profile of the aircraft.

- Establish a process which precludes a proliferation of non-standard noise abatement procedures for unique airport/community conditions.

Proposed Resolution: The following proposal is offered for the purpose of initiating discussion and to serve as a basis for exploring alternative approaches and shall not be construed as an FAA recommendation or position.

1. Develop and publish a revision to Advisory Circular (AC) 91-53 to establish a set of standard noise abatement procedures from which an operator can select one or two of the procedures as the standard for a particular airplane type. The (AC) would specify that an operator could select a procedure or a combination of procedures which is or are optimal for that airplane type. The operator would then train flightcrews who operate that airplane type to use only the selected procedure or combination of procedures. Once the standard procedure or procedures were adopted by a operator, they would be used for all airport/community environments, as appropriate. For the purpose of standardization, efficiency of training, noise abatement and airport/community planning up to three standard takeoff procedures for each airplane type could be used. The three standard takeoff procedures for the purpose of this duscussion are referred to as follows:

- o Normal takeoff procedure
- o Standard close-in takeoff noise abatement procedure
- o Standard far-out takeoff noise abatement procedure

2. Normal Takeoff Procedure: The normal takeoff procedure may be developed by the manufacturer and adopted by the operator or it may be a procedure developed by the operator. The normal takeoff procedure would be used on runways where noise abatement is not a factor or on runways where the standard noise abatement procedures do not provide any significant or the desired noise relief. The normal takeoff procedure would be reviewed and approved at the local FAA District Office level provided it is consistent with the criteria listed below:

a) Set takeoff thrust as specified by the operator (either maximum takeoff thrust or an appropriate reduced takeoff thrust setting).

b) After takeoff, climb at an airspeed of V_2 + 10 to 20 knots until attaining an altitude specified by the operator (either a standard altitude or an obstacle clearance altitude) but not lower than 500 feet.

c) At the altitude specified by the operator, decrease pitch and accelerate to V_{zf} while retracting flaps on schedule (if flaps are not used for takeoff, decrease pitch and accelerate to climb speed).

d) After attaining V_{zf}, or at a point specified by the operator, set climb thrust and initiate a climb profile as specified by the operator.

3. Standard Noise Abatement Procedures: Perceived takeoff noise depends on the airplane/engine combination, takeoff configuration, performance characteristics, and the takeoff initial climb procedure used as well as the environmental (noise sensitive) characteristics of the airport. An operator may determine that for a particular airplane type the normal takeoff procedure

provides the best overall relief at noise sensitive airports (including both close-in and far-out noise sensitive areas). For another airplane type, an operator may determine that a single noise abatement procedure is appropriate for both close-in and far-out noise sensitive areas and as a result the operator would adopt and use a normal takeoff procedure and a single standard takeoff noise abatement procedure. However, for many airplanes in operation today, there is an optimal takeoff procedure which provides the most relief for close-in noise sensitive areas and another takeoff procedure which provides the most relief for noise sensitive areas that are further out from the runway. As a result, an operator may determine that three takeoff procedures need to be adopted for the type of airplane operated and the environmental characteristics of the airports served. An operator would not be authorized to use more than three standard takeoff procedures (a normal, close-in, and a far-out takeoff procedure).

a. Noise abatement procedures are either developed by the manufacturer and adopted by the operator or they are developed by the operator. There are two general categories of noise abatement procedures.

1) One category provides relief to noise sensitive areas that are "close-in" to the end of the takeoff runway. The procedures in this category generally involve climbing in the takeoff configuration to a specified altitude and then simultaneously decreasing pitch and setting a predetermined cutback thrust and overflying the noise sensitive area before accelerating, retracting flaps, and setting climb power.

2) The other category provides relief to noise sensitive areas that are "far-out" from the end of the takeoff runway. The procedures in this category generally involve climbing in the takeoff configuration to a specified altitude and then decreasing pitch to accelerate while retracting flaps and after the flaps are retracted (or partially retracted) setting a predetermined cutback thrust and overflying the noise sensitive area before setting climb power.

b. The optimum type of procedure for either a close-in or far-out noise sensitive area is highly dependent on the airplane's takeoff configuration and performance characteristics as well as the takeoff weight. If it is determined that both close-in and far-out noise abatement procedures are needed for a particular airplane type, an operator would be able to select two standard noise abatement procedures and train flightcrews in their use. The operator, in this case, would have to instruct flightcrews on which procedure to use for particular runway/noise sensitive area environment.

c. Obstacle clearance requirements must be considered when selecting an altitude at which either a flap configuration change is initiated or at which a thrust cutback is initiated for noise abatement purposes. Obstacle clearance altitudes are a variable altitude depending on the airport and surrounding terrain or obstacles. The amount of noise relief provided by a standard noise abatement procedure at a particular runway/noise sensitive area environment is also dependent on the altitude at which either the flap

configuration change is initiated (with subsequent thrust cutback) or at which the thrust cutback is initiated in the takeoff configuration. By adjusting this initiating altitude, noise relief can be optimized for a particular runway/noise sensitive area environment. The initiating altitude would be the only variable permitted for particular standard noise abatement procedure. The operator would have to specify the initiating altitude for a particular runway/noise sensitive area environment.

d. When the initiating altitude is established at the lower altitudes, the available airspace in which to maneuver is decreased. In addition, decreased thrust levels, decreases performance margins. Therefore, in order to ensure adequate safety, specific criteria would have to be met before approving the use of an initiating altitude below 1,000 feet and/or approving the use of a cutback thrust setting lower than that necessary to maintain the takeoff path engine-inoperative climb gradients specified by FAR 25.111(c)(3) (assuming an engine failure without any thrust advance on the remaining engine(s)). The general criteria that would have to be met for each procedure and airplane type are as follows:

(1) The procedure would have to be operationally evaluated and tested by the FAA for the airplane type. The factors and specific criteria that would be considered by the FAA are outlined in Attachment 1. The Director, Flight Standards Service (AFS-1) would be responsible for reviewing the results of the tests and if satisfactory approving the procedure for the particular airplane type. Once a specific procedure for an airplane type has been approved by AFS-1, it could then be approved for specific operators.

(2) Any procedure which specifies an initiating altitude below 1,000 feet and a cutback thrust of less than that necessary to maintain the FAR 25.111(c)(3) gradients would have to incorporate an automatic thrust cutback system, an automatic thrust advance system, and a GPWS capable of alerting the flightcrew of any descents which occur below 1,500 feet AGL. The automatic thrust cutback system, however, is not required if the procedure prohibits thrust cutback below 1,000 feet AGL. In no case shall the takeoff path engine-inoperative climb gradient be less than 0%.

(3) Any procedure which specifies an initiating altitude of 1,000 feet or above and a cutback thrust of less than that necessary to maintaining the FAR 25.111(c)(3) gradients would have to incorporate an automatic thrust advance system and a GPWS capable of alerting the flightcrew of any descents which occur below 1,500 feet AGL. In no case shall the takeoff path engine-inoperative climb gradient be less than 0%.

f. In the interest of keeping the standard noise abatement procedures to a minimum, operators would be able to request that the procedures outlined in Attachment 2 (close-in) and Attachment 3 (far-out) be approved for their operations. The approval level would be indicated for each procedure. An operator may request approval of a procedure different than the ones outlined in Attachments 2 and 3 by submitting a request through the assigned POI to AFS-1 for appropriate processing.

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